

Support of METOC Sabbatical Research and Training

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LONG-TERM GOALS

The long-term goal of this project is to improve the U.S. Navy Meteorology/Oceanography (METOC) community's ability to support the operational Navy (surface ships, submarines, anti-submarine warfare (ASW), air squadrons, SEALs, and amphibious forces) with tactically relevant meteorological products derived from data, models, and tactical decision aids (TDAs).

OBJECTIVES

My objectives in this project are as follows:

- i) To evaluate the METOC community's use of meteorological products in the regional METOC centers and facilities, including an assessment of which products are currently being used most frequently and which are most useful (this not necessarily being the same as the previous).
- ii) To suggest ways in which the METOC community could improve their meteorological support, through changes which could be made to improve the utility of their products, introduction of new products, and changes in training to allow METOC personnel to take better advantage of the METOC products available to them.
- iii) To identify data and technology available through the academic and government research community that could be of use to the operational community.
- iv) To facilitate cooperation and collaboration between regional METOC centers and facilities and nearby civilian, or non-Navy government, oceanographic centers.
- v) To provide feedback to the Naval Postgraduate School Meteorology Dept. on how our graduates are faring, and what changes we might make to our curricula to help our future graduates in their careers.
- vi) To provide on-site training in mesoscale meteorology and applications of mesoscale models.

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APPROACH

The approach to accomplishing the above-stated objectives is to visit, together with my oceanographer wife, Dr. Leslie Rosenfeld, each of the regional METOC centers and facilities for one to six weeks over the course of a year. This affords a rare opportunity for an “outsider” to evaluate over an extended period of time how METOC products are being used in an operational setting, as opposed to just seeing a demonstration in a briefing or during a short visit. Since I hold a Secret clearance, I will have access to most of the tools and data used by the METOC community. During these visits I will not just examine the METOC products produced by these commands, but also watch how they are producing them. To a limited extent, I will also be able to observe operations at sea.

Early in the project, and then again in the middle, I will visit the Naval Meteorology and Oceanography Command (NMOC) and its production centers, the Naval Oceanographic Office (NAVO) and Fleet Numerical Meteorology and Oceanography Center (FNMOC) to familiarize myself with Navy ocean products currently available and under development.

In addition, I will visit civilian labs that are located close to METOC sites for the purpose of assessing, and enhancing, the degree of cooperation and collaboration between the operational and academic research communities on a regional level.

WORK COMPLETED

During FY00, I visited the METOC centers at San Diego, CA; Yokosuka, Japan; Norfolk, VA; and Rota, Spain for six weeks each, and the centers at Pearl Harbor, HI; and Manama, Bahrain for two weeks each. I spent two weeks at the facilities in Whidbey Island, WA and Jacksonville, FL and one week at the facilities in Naples, Italy. During each of the aforementioned stops, I also took advantage of opportunities to visit METOC officers and divisions on nearby ships and staffs, visited a few detachments and components, and flew out to the aircraft carriers USS Enterprise off Norfolk, and USS Eisenhower in the Arabian Gulf, for overnight stays. I have also spent a total of about three weeks in Mississippi visiting NRL, NAVO, CNMOC, the schoolhouse for enlisted aerographers' (AG) training at Keesler Air Force Base, and the Basic Officer Assession Training (BOAT) school in Gulfport. I spent two weeks in Washington D.C. visiting ONR, the Naval Academy, the METOC detachment at Patuxent Naval Air Station, the Navy Ice Center and various operational NOAA offices; and one week in London including visits to the ONR London office, the European Center for Medium-Range Weather Forecasting (ECMWF), the British Navy's Fleet Weather/Oceanography Center, and the British Commodore responsible for meteorology and oceanography. During four one-week visits back to Monterey, I met with FNMOC staff to become better informed about, and provide feedback on, their METOC products.

I conducted training (individual, small group, and formal presentations), evaluated analysis and forecast products, and recommended ways to improve command knowledge and operations. Training topics included: uses of mesoscale numerical forecast models, advances in marine satellite remote sensing, use of ocean circulation models, forecasting with ensembles, and other subjects. During the sabbatical, Dr. Rosenfeld and I also prepared reports on selected topics, including recommendations on training, and summaries of Navy ocean circulation and tide models, and surface wave models.

During the extended visits to the regional centers and facilities I was able to observe, and participate in, activities which were carried out in support of routine operations, fleet exercises, and actual

missions. I went through the meteorological products on each command's classified and unclassified web sites, observed how all meteorological products were prepared, and asked a lot of questions. I spent time on the watch floor and with the Mobile Environmental Teams (MET). I worked most extensively with the watch sections, Operations Officers and the civilian Science and Technology Officers (STOs).

Along with the civilian STO or science advisor, I visited local academic oceanographic departments, including University of Tokyo, Old Dominion University, University of Cadiz, and University of Washington, helping the Navy regional centers to establish contacts with these institutions.

Prior to leaving each center, Dr. Wash and I delivered an outbrief to the commanding officer outlining our activities and observations, and recommending ways to improve command knowledge and operations. A follow-up report has been delivered to the commands visited during the first half of the year, and the others will follow shortly.

RESULTS

A major finding of this study is that technical education and training is inadequate to allow METOC personnel to take maximum advantage of the full range of data, models, and TDAs available to them. This results in the underutilization of METOC assets and systems, such as the Naval Satellite Data System (NSDS-E), MODAS, Distributed Atmospheric Mesoscale Prediction System (DAMPS), and ocean circulation models. I also identified weaknesses in the quality control and verification of METOC analysis and forecast products. On the positive side, this project identified a number of exemplary practices employed at one or more commands that would be of widespread benefit throughout the CNMOC claimancy. Examples include use of a database to track training progress, use of satellite scatterometer and altimeter data to validate wind and sea warnings, and creation of fused products to display a wide variety of data types in a convenient and understandable manner.

IMPACT/APPLICATIONS

The potential future impact of this project is to improve the characterization and prediction of the battlespace environment through astute use of ocean observations and models. More immediate impacts are already being seen. As a direct result of some of our suggestions, NAVO is providing more information with some of their products, including things like model forcing and spatial resolution. Some of our recommendations to the regional center COs regarding training and operations have also been implemented or are under investigation.

The newly established Professional Development Command (PDC) backed the presentation of a one-week course on mesoscale meteorology for the STOs and is funding the development of training modules on that topic. They are also considering funding the development of materials to train AGs and junior officers to make more effective use of ocean circulation and tide models.

With the advent of mesoscale meteorology analysis and forecast tools and real-time ocean analysis and prediction models, the traditional synoptic meteorological focus of the regional METOC centers is changing. It is our hope that the results of our study will help to shape the future role of regional METOC centers and facilities.

TRANSITIONS

The PDC recently informed NPS that they will fund extensive number of mesoscale training modules, to be developed at NPS and COMET, to address the training shortfalls identified by this project.

RELATED PROJECTS

This project was undertaken in partnership with Dr. Leslie Rosenfeld who received ONR funding under document number N0001400WR20157. While my project emphasized mesoscale meteorological training and evaluation of how the METOC centers utilize meteorological models and data to help the fleet, her focus was on the oceanographic side. This project was also related to the ONR project, "Collaborative Research Projects in the Support of FNMOC Operational Mission", N0001400WR20026. Some of the NPS theses results supported by this project were briefed and demonstrated to the METOC centers during the sabbatical.